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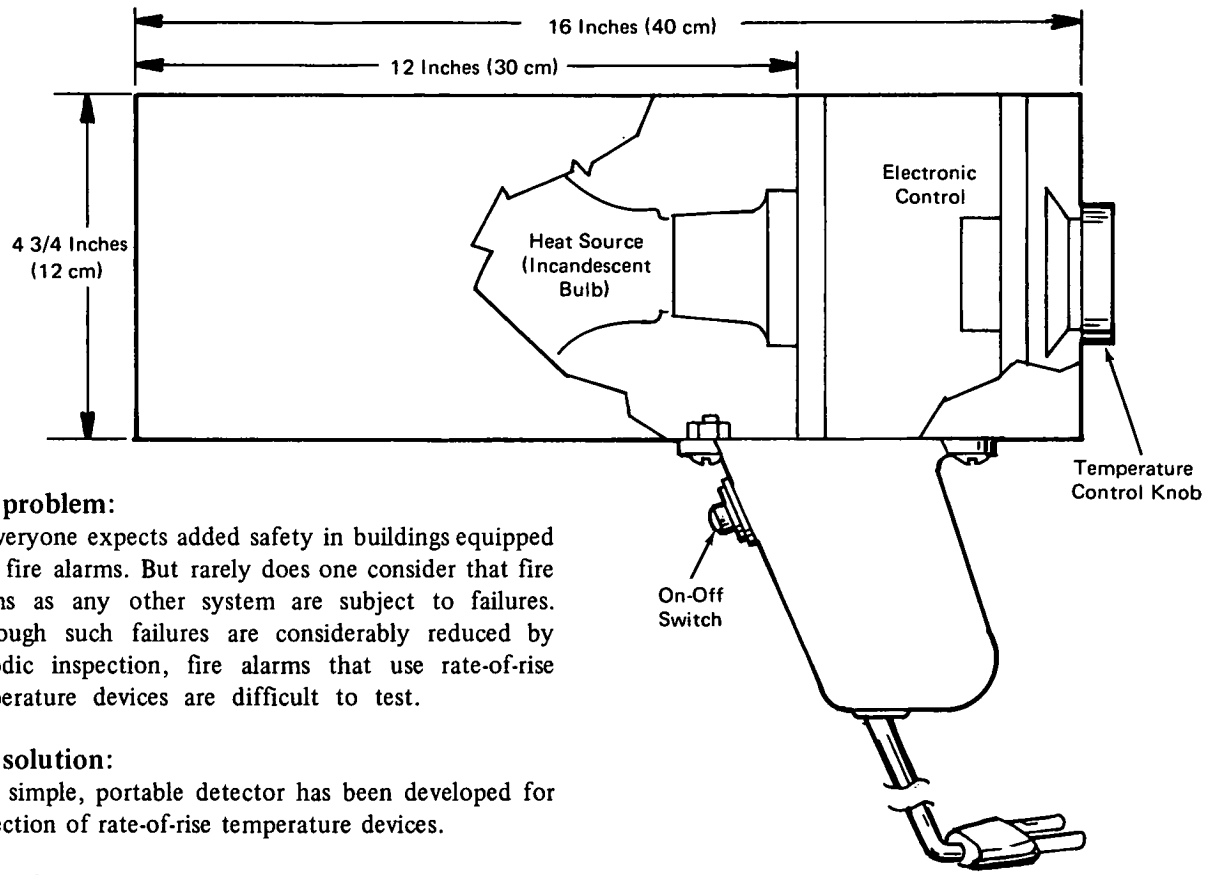
NASA TECH BRIEF

Goddard Space Flight Center

Detector For Inspection of Fire Alarms



The problem:

Everyone expects added safety in buildings equipped with fire alarms. But rarely does one consider that fire alarms as any other system are subject to failures. Although such failures are considerably reduced by periodic inspection, fire alarms that use rate-of-rise temperature devices are difficult to test.

The solution:

A simple, portable detector has been developed for inspection of rate-of-rise temperature devices.

How it's done:

A rate-of-rise temperature device operates by detecting changes in air pressure. The device consists of two enclosed chambers which are separated by a flexible diaphragm. Built into one chamber is a calibrated leak which is set to the desired alarm sensitivity. When the temperature of the surrounding air rises at a slow rate, air in the lower chamber begins to expand pushing the diaphragm into the upper chamber. At this point the calibrated leak begins to release part of the expanded air so that the diaphragm does not advance sufficiently into the upper chamber. However, when the rise rate is rapid, the leak cannot compensate for the rapid air expansion. Thus the diaphragm expands into the upper chamber to the point where it activates a switch to sound the alarm.

The detector developed for testing these devices is a metal cylinder (see figure), 4-3/4 inches (12 cm) in diameter and 16 inches (40 cm) long, fitted with a pistol grip which contains an on-off switch. Inside, the

(continued overleaf)

cylinder is divided into two compartments. The first one, used for heating an enclosed air mass, is 12 inches (30 cm) long and open in the front. It contains a 100-W incandescent bulb as the source of heat. The second compartment encloses a solid state circuit which is used to control the bulb temperature. An additional box (not shown), 2 by 2 by 4 inches (5 by 5 by 10 cm), is mounted in the vicinity of the bulb. It contains a photocell, a battery, a switch, and a meter to check the bulb for proper output intensity which may vary with line voltage.

The first step in inspection of the fire alarm device requires calibration of the bulb to produce a certain temperature. It is estimated that a 44-W input to the bulb will heat 0.123 ft^3 (0.004 m^3) of air at a rate of 15° F/min (8.5° C/min). Calibration is done by turning on the bulb and taking a reading on the meter while the open end of the cylinder is covered by a suitable material. The meter reading corresponds to a bulb temperature, and if it is incorrect, the bulb temperature control is adjusted. With the calibration complete, the open end of the detector cylinder is placed over the alarm device. If a rate of 15° F/min (8.5° C/min) is selected, a properly functioning alarm device will be activated in approximately 40 seconds.

Notes:

1. The detector must be cooled for approximately 5 minutes between tests to make sure that each test is started at ambient temperature.
2. Requests for further information may be directed to:
   Technology Utilization Officer
   Goddard Space Flight Center
   Code 207.1
   Greenbelt, Maryland 20771
   Reference: TSP73-10128

Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning non-exclusive or exclusive license for its commercial development should be addressed to:

Patent Counsel
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